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SYNOPTIC METEOROLOGY AS A GEOGRAPHICAL SCIENCE

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Although climatology has been considered a geographical study for a long time, the development of this science has followed a circuitous route, and such famous climatologists as Dove and G. I. Vil'd were not geographers. A. I. Voyeykov in Klimaty Zemnogo Shara (Climates of the Earth) and in all his other climatological works upheld the position of climatology as a geographical study by pointing out the close relationship between climate and the whole complex of physico-geographical processes. The fruitfulness of this geographical approach to climatology becomes quite evident when the geographical-climatological works of Voyeykov, I. S. Berg and others are compared with the formalistic monographs of the school of Vil'd. In these monographs climate is examined as being rather independent and isolated not only from the geographical complex, but often even from atmospheric activity in relation to which climate is actually only a result.

A new trend of climatology, which has been named "dynamic climatology", clearly emphasizes the geographical nature of climatology, explaining climate by the general circulation of the atmosphere as well as by the geographical conditions associated with the atmosphere. It is true that in this field of study we sometimes tend to underestimate the secondary geographical factors of climate such as relief or bedrock deposits. Their inclusion in a system of dynamic climatology obviously does not alter the essential nature of the study but only introduces details into the picture of the origin of climates which have been sketched in more general strokes inasmuch as the general circulation of the atmosphere is a primary factor of climate. From this point of view, the well-known genetic classification of climates of B. P. Alisov fully permits further development on the basis of a calculation of secondary factors.

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A wide circle of geographers finds it more difficult to realize that another important meteorological (more precisely, macrometeorological) study, synoptic meteorology, is by its nature also a geographical study, or, at least, can and must develop along geographical lines. Originating about 100 years ago, synoptic meteorology was for a long time a technical skill rather than a scientific study. Empirical conditions and work methods relating primarily to purely external fluctuations of the baric field and to the forecasting of these fluctuations were for a long time separated both from dynamic meteorology, which was developing at about the same time, and from geography. The geographical factors in synoptic processes were scarcely touched upon during a period of 90 years because the synoptic method was far from revealing the mechanism and physical factors of the processes.

The situation has now changed very much. As is known, the present frontological method of synopsis as the first task in the analysis, and the prerequisite in the forecast of weather, provides a physical, dynamic-thermodynamic understanding of synoptic processes. New concepts of synoptic meteorology such as those of the air mass, the front, frontogenesis, all of which are complex physical concepts, stimulate an understanding of the causes and effects of macroprocesses. Based on these new synoptic concepts, even a systematic circulation explanation of climate has become possible. Voyeykov definitely acknowledged the necessity of such an explanation although in his time it could not yet be complete or systematic.

It is precisely the physical character of the new ideas of ~~synoptic~~ meteorology which makes it a geographical science. The physical mechanism of atmospheric macroprocesses are not isolated from the geographical setting, but have clearly expressed geographical characteristics. The origin and transformation of air masses, the peculiarities of major fronts and their frontogenesis, the nature of systems of condensation connected

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with masses and fronts, and the peculiarities of movements of cyclones and anticyclones all have a general dynamic-meteorological basis for every type of process or activity, but are at the same time extremely diversified in their manifestations and in their dependence on the geographical factors in phenomena. Synoptic meteorology makes use externally of the geographical method of investigation by a representation of weather processes on maps, and there are some aspects of meteorology which, like climatology, do not have the general geophysical basis of meteorology but rather a geographical basis.

The more confidently and consciously the synoptic meteorologist looks for relationships between synoptic processes and the other component physical and geographical processes in concrete geographical settings (they had been doing this in rudimentary fashion for a long time), the more fully will synoptic meteorology develop along geographical lines.

But, in a broad sense, even geographers must realize that the synoptic process, the atmospheric microprocess, is merely a part of the physico-geographical process; that the peculiarities of the synoptic processes in this or any field are as inseparable a part of the geographical landscape as is climate. Moreover, the synoptic processes of a given region possess an even greater degree of physico-geographical reality than climate which is to a significant degree an abstraction from the real conditions of weather bound up with synoptic processes.

It seems to us that it is not enough for a geographer to be interested in synoptic meteorology only to the extent that dynamic climatology is built on certain of its conclusions. General and specific studies on synoptic processes must likewise be considered an inseparable part of geography. Climatology and synoptic meteorology are two studies with independent origins and developments which are joined in essence by: (1) the scope of the studies of atmospheric phenomena or activities, which are macrometeorological studies; (2) by a geographical approach to the

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activities being studied insofar as these activities, which are a combination of synoptic processes and the climatic types dependent upon them, have in essence a geographical nature, distributed over the surface of the earth and a reciprocity with other geographic factors and phenomena. As a consequence, synoptic meteorology must occupy the place rightfully belonging to it, both in a system of geographical sciences and in the teaching of geography, along side of climatology, or even before climatology.

It is possible that these ideas have not previously been expressed as categorically as is being done here. However, these statements merely sum up or formulate many ideas which have already occurred to geographers, or which have actually been put into practice. Synoptic meteorology occupies a prominent place on the geographical faculties of our universities. The overwhelming majority of our climatologists are convinced of the necessity of an even more thorough treatment of synoptic and circulation fundamentals in the study of climate. Books in which the geographical concept of synoptic meteorology is developed in an "accidental" rather than a well-thought out fashion arouse the interest and sympathy of a wide circle of geographers. The studies which now arouse their interest and sympathy were until recently almost unknown to this wide circle. Not wishing to insult anyone, I must however point out that in overall geographical compilations in otherwise quite correct and often profound expositions of climatological problems, there were too often elementary errors and inadmissible anachronisms whenever the subject of synoptic meteorology was brought up (usually superficially). A mutual tie-up between synoptic meteorology and geography on the basis of a recognition of the geographical nature of synoptic meteorology can only result in mutual benefits.

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